

Remarks

Applicants have amended claims 1, 9, and 10, and have added dependent claims 21-23. No new matter has been added to the application by virtue of the present amendment.

Therefore, claims 1-13 and 21-23 are pending in the subject application by virtue of the present amendment. Claims 14–20 have been withdrawn. Applicants respectfully request that the amendments to claim 1, 9, and 10 and new claims 21-23 be entered. Applicants respectfully submit that the amendments to claims 1, 9, and 10 and new dependent claims 21-23 more clearly define Applicants' application and distinguish it over the prior art of record. It is respectfully requested that the subject application be reconsidered and passed to issuance in view of this amendment and response.

Claim Rejections - 35 U.S.C. § 102(b)

The Examiner rejected claims 1-4 and 8 under 35 U.S.C. § 102(b), as being anticipated by Terui, U.S. Patent No. 6,225,694. With regard to independent claim 1, the Examiner indicated that Terui discloses a semiconductor package incorporating the elements claimed by Applicants. The Examiner stated that Fig. 1 of Terui teaches a chip carrier including ground pad, a semiconductor chip, a conductive lid, and a conductive structure. Applicants respectfully traverse the rejection under 35 U.S.C. § 102(b), and submit that Terui does not anticipate or suggest applicants' independent claim 1.

Applicants have amended independent claim 1 to recite the limitations of "... a conductive lid substantially coplanar with said first side of said chip carrier thermally coupled to said semiconductor chip; ...". Support for Applicants' amendment can be found, for example, in Fig. 4.

Terui does not anticipate or suggest Applicants' independent claim 1, as amended, or claims dependent thereupon. The Terui patent is specific to a formed or machined metal made cap [15] that has feet, as shown in Terui Fig. 1, in close proximity to the chip carrier surface, which as viewed by one skilled in the art, the gap between the lid foot and the chip carrier would be 0.1 mm or less. The metal cap [15] of Terui, as shown in Terui Fig. 1, has substantially curved portions

(feet) that bring it in close proximity to the chip carrier surface. The present application, as amended, claims a conductive lid that is substantially coplanar, along its entire length, with the top surface of the chip carrier. The gap between the bottom surface of the substantial coplanar conductive lid and the top surface of the chip carrier, as viewed by one skilled in the art, would be at least 0.7mm, see paragraph [0031].

This is substantially different than the Terui patent that uses a substantially curved, formed or machined metal made cap with feet in close proximity to the chip carrier. Further, Terui does not anticipate or suggest a conductive structure as claimed and described in the present application. The examiner points to a seal ring Terui Fig. 1 [4] as anticipating the conductive structure; however, applicant respectfully disagrees. Terui Fig. 1 [4], as described in Terui, is a seal ring substantially embedded in the chip carrier surface and electrically connected to pads for forming external terminals. The conductive structure of the present application is not a ring, but rather a conductive structure positioned on the top surface of the chip carrier Fig. 4 [400] and is electrically coupled to a ground pad and the conductive lid, and thermally coupled to the semiconductor chip. In addition to its thermal and electrical coupling functions, it provides for structural support and integrity, approximately 90% of the approximately .7 mm gap between the chip carrier and the conductive lid leaving only a thin gap to be filled with electrical and thermal conductive material see paragraph [0040]. This makes strain and stress build up less of a concern due to the unique physical properties provided by the conductive structure.

The use of a conductive lid substantially coplanar with the top surface of the chip carrier as described in the present application offers a number of advantages not afforded or possible with the formed or machined metal made cap described in the Terui patent. A conductive lid substantially coplanar with the top surface of the chip carrier is less costly and is extendable to use for a number of different parts. Use of existing manufacturing equipment can be employed to attach the chip elements without requiring retooling or modification to the existing equipment. Additionally, grounding of a substantially coplanar conductive lid as claimed in the present application to a chip carrier requires different technical implementation and requirements not anticipated or suggested by Terui. In the present application there is a large gap (approximately 0.7 mm) between the

bottom surface of the conductive lid and the top surface of the chip carrier. In the case of Terui, as viewed by one skilled in the art, the gap between the lid foot and the carrier would be 0.1 mm or less and bridging this vertical gap is a straightforward process using either solder or isotropically electrically conductive adhesives. Anisotropically electrically conductive adhesives, as taught by Terui, are a less than optimal choice and would likely result in an unreliable electrical connection in the structure disclosed by Terui. In the present application, making an electrical connection for a 0.7 mm vertical height is not conducive to solely using either solder or isotropically, electrically conductive adhesives. A solder height of 0.7 mm requires a large pad area which takes up substantial valuable real estate on the chip carrier surface. Bridging the 0.7 mm gap would also be difficult for an adhesive due to tendency to slump after dispense which would drive dispensing large amounts over larger areas to build up the 0.7 mm height necessary to bridge the 0.7 mm gap. Additionally, due to its tall height, such adhesives would be more prone to damage due to movement, handling, shock or vibration and thus be less reliable. These limitations are overcome by the use of the conductive structure with the conductive lid substantially coplanar with the top surface of the chip carrier.

Applicants respectfully submit that, "A claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference." MPEP §2131. In this case, Terui does not anticipate or suggest the element of a conductive lid substantially coplanar with the top surface of the chip carrier or a conductive structure as claimed by Applicants. The Terui reference teaches a formed or machined metal cap that has substantially curved portions that bring it in close proximity to the chip carrier surface and a ring seal that does not have the same properties and structure as that of the substantially coplanar conductive lid and conductive structure claimed by Applicants. Accordingly, Applicants respectfully submit that Terui is inapposite to the invention claimed herein.

Claims 2 - 4, and 8 are dependent upon Claim 1; and as discussed above, Claim 1 is not anticipated by Terui because Terui does not disclose all the elements of claim 1. Therefore, Applicants respectfully submit that the rejection of Claims 1 - 4 and 10 under 35 U.S.C §102(b) has been overcome and believe that all claims are in condition for allowance

Claim Rejections - 35 U.S.C. § 103(a)

The Office Action stated that claims 5-6, 10 and 12 are rejected under 35 U.S.C. § 103(a), as being unpatentable over Terui in view of U.S. Patent No. 5,866,943 issued to Mertol. The Examiner rejected claim 7 under 35 U.S.C. § 103(a), as being unpatentable over Terui in view of U.S. Patent No. 6,562,655 issued to Glenn. The Examiner also rejected claim 9 under 35 U.S.C. § 103(a), as being unpatentable over Terui in view of U.S. Patent No. 6,630,661 issued to Hoffman. Examiner further rejected claim 11 under 35 U.S.C. § 103(a), as being unpatentable over Terui and Mertol as applied to claim 10, and further in view of Glenn. Examiner also rejected claim 13 under 35 U.S.C. § 103(a), as being unpatentable over Terui and Mertol as applied to claim 10, and further in view of Hoffman.

As discussed above, Applicants respectfully submit that Terui does not anticipate or suggest Applicants' independent claim 1 as amended, or any claims dependent thereupon.

Based on the foregoing, Applicants respectfully traverse the rejection under 35 U.S.C. § 103(a) and submit that the rejection to claims 5-7 and 9-13 has been overcome.

Conclusion

In light of the foregoing remarks, all of the claims now presented are believed to be in condition for allowance, and Applicants respectfully request that the outstanding rejections be withdrawn and this application be passed to issue at an early date.

The Examiner is urged to call the undersigned at the number listed below if, in the Examiner's opinion, such a phone conference would aid in furthering the prosecution of this application. No fee is due by virtue of this response. However, if the PTO determines that a fee is required, please charge Applicants' Deposit Account, 09-0456.

Respectfully submitted,

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